

## Workshop Presentation

# Advanced Control and Power Technologies for Petroleum Refineries and Petrochemical Plants

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**Date: May 16, 2006**  
**8:30 AM – 4:00 PM**

**Pacific Gas & Electric**  
**3301 Crow Canyon Rd**  
**San Ramon, CA 95483**

**Date: May 18, 2006**  
**8:30 AM – 4:00 PM**

**The Gas Company**  
**9240 Firestone Blvd**  
**Downey, CA 90241**

## Introduction

Energy Savings and Improved Operations Efficiency can be achieved by Appropriate Application of Proven Technologies

Implementation of Advanced Control and Power Technologies has the potential to transform operations in petroleum refining and petrochemical production. Yet research indicates there is a reluctance to adopt proven technologies that can significantly improve the process.

A significant amount of energy is wasted in the average refinery and petrochemical plant. Additionally, productivity and reliability gains are not being realized because of a reluctance to adopt relevant proven technologies or through mis-application of those technologies. Energy savings are not simply related to lower electrical energy usage due to the application of these appropriate technologies, but include an additional and MUCH bigger prize realized as reduction in fuel usage and improvements in process efficiency.

- A typical small refinery producing 125,000 BPD could save \$46.6 million/yr on an \$82 million investment (2003 gas prices).
- An average petrochemical plant could save \$35 million/yr on a \$62.5 million investment (2003 gas prices.)

## Why Attend

Understanding pressure and speed control, along with the systematic application of advanced control algorithms, offers reliability, tighter process control, increased process capacity, reduced maintenance costs, and reduced emissions. Compressors, fans, pumps, burners, and heat exchangers, along with their associated control valves and dampers, can all provide improved performance when correctly specified and coordinated within the total system. Tools available to engineers in the petroleum refining and petrochemical industries have evolved such that it is possible to incorporate combinations of components that are highly reliable and energy efficient and that also improve process efficiency.

### Case Study: 80% Fuel Reduction Realized

Straightforward changes in an industrial process can yield significant savings. A thermal oxidizer recently equipped with an oxygen analyzer and an adjustable speed drive achieved a remarkable 80% reduction in natural gas used in the process and provided a pay back in less than three months. Four units of energy had been wasted for every single unit of energy actually used. For every \$100 spent, \$80 had been thrown away. The industry can benefit from a very big prize that is known to exist and is there for the taking.

## Purpose of Workshop

This workshop will increase your understanding of the use of Advanced Control and Power Technologies in the petroleum refining and petrochemical industries. It will present appropriate, systematic and effective applications for improved electrical reliability and increased production capacity, and for energy savings. The training will be reinforced by relevant illustrations.

Consideration will be given to technology presently available, pressure and speed control as applied to the process, good and bad applications, economics screening for applications, a total systems approach, and the importance of correct specification.

**This is an interactive, hands-on training workshop. Attendees are invited to bring along actual case histories and questions for discussion.**

Attendees' case histories may include but are not limited to:

- Examples of heat exchangers without flow and temperature sensors
- Examples of fuel gas furnaces that operate without oxygen sensors
- Examples of low NOX burners that have been introduced without combustion evaluation
- Examples of unusual failure rates on control valves, bearings, duct work, and pipe work

## Agenda

7:30 am Coffee and Light Breakfast

8:30 Session One

Part One: Introduction and Objectives

Part Two: Overview of the Potential for Energy Savings and Operations Efficiency

Part Three: DOE Tools

10:00 Break

10:15 Session Two

Part One: Control Opportunities

Part Two: Power Opportunities

Part Three: Applications

Part Four: Energy Efficiency Programs for the Industrial Customer.

12:00 Lunch

1:00 Session Three

Part One: Case Histories, including attendees' contributions

Part Two: Total Systems Approach

2:30 Break

2:45 Session Four

Part One: Improvements that have occurred in Control and Power Technologies

Part Two: Independent Objective Equipment Specifications

Part Three: Discussion and Conclusions

4:00 Adjourn

## Who Should Attend?

The following petroleum refining and petrochemical plant personnel should attend:

Process engineers

Mechanical engineers

Economics engineers

Process automation engineers

Energy engineers

Energy planning advisors

Product developers

Reliability engineers

Electrical engineers

Optimization engineers

Loss control engineers

Maintenance managers

Operations managers

Business strategists

## Topics

The course will cover a wide range of topics related to advanced control and power technologies, including:

- Reducing plant operating costs
- Improving plant production capacity
- Improving plant energy optimization
- Reviewing available, proven technologies
- Reviewing control strategies
- Identifying causes of energy losses
- Identifying available resources
- Quantifying business potential
- Identifying opportunities for improvement
- Implementing Advanced Control and Power Technologies
- Overcoming existing barriers
- Potential cofunding opportunities
- Benefits of electric utility Industrial Program
- An introduction to DOE's suite of tools and case histories in the use of SSAT to optimize steam costs

## History

Previous work sponsored by the U.S. Department of Energy and the California Energy Commission is described in the Phase 1 Report, *"Implementing Advanced Control and Power Technologies to Improve Energy Efficiency and Reduce Operating Costs for U.S. Petroleum Refining and Petrochemical Manufacturing."* The Phase 1 study determined the effectiveness of control and power technologies currently being used in U.S. refineries and petrochemical plants and identified opportunities for energy savings, increased productivity, and improved reliability that could be achieved based on alternative control and power technologies. Based on 2003 gas prices, this Report found that:

- A typical small refinery producing 125,000 BPD could save \$46.6 million/yr on an \$82 million investment
- An average petrochemical plant could save \$35 million/yr on a \$62.5 million investment

Another Phase 1 Report, *"Using Advanced Control and Power Technologies to Improve the Reliability and Energy Efficiency of Petroleum Refining and Petrochemical Manufacturing in California,"* determined the effectiveness of control and power technologies specific to California.

Contributors to the Phase 1 Report included ChevronTexaco, Pascagoula, Mississippi; Chevron Texaco, Barber's Point, Hawaii; Chevron Texaco Richmond Refinery, California; Chevron Texaco, El Segundo, California; Shell, Norco, Louisiana; Shell, Wilmington, California; Shell, Bakersfield, California; Shell, Martinez, California; Valero, Benicia, California; ExxonMobil, Joliet, Illinois; Exxon Mobil, Torrance, California; ConocoPhillips, Sweeny, Texas; ConocoPhillips, Ponca City, Oklahoma; ConocoPhillips, Wood River, Illinois; ConocoPhillips, Rodeo, California; ConocoPhillips, Wilmington, California; BP, Carson, California; BP, Cherry Point, Washington; BP Chemicals, Lima, Ohio; Tesoro, Martinez, California; Apex, Long Beach, California; Kern, Bakersfield, California; DOW Chemicals, Freeport, Texas; Equistar Chemicals, Houston, Texas; BASF, Houston, Texas; Solutia, Greenwood, South Carolina; and DuPont, Old Hickory, Kentucky.

# Course Instructor

**Roger G. Lawrence, PE CEM**  
**Sole Proprietor**  
[www.rglsolutions.com](http://www.rglsolutions.com)



Mr. Lawrence is an independent consultant and sole proprietor based at NCSU in Raleigh, North Carolina. He provides specialized engineering services that cover a broad spectrum of engineering functions relevant to a variety of industries, including process industries. In particular he promotes the appropriate application of electrical equipment for system reliability and energy conservation. He is a problem solver who has experience of both the industrial manufacturer and the electric utility. Mr. Lawrence draws on 27 years of electrical design and manufacturing experience and 7

years as technical consultant and director of special projects for EPRI. He has published a number of technical papers and presents tutorials and workshops. He serves as a member of the IEEE Standards Committee P1566 (for adjustable speed drives larger than 500hp). He is the Vice Chair of the Chemical Subsection of IEEE PCIC.

## Academic and Professional Qualifications:

BSc (Eng) and ACGI from Imperial College, London University 1966

MBA from Mercer University 1985

Chartered Engineer (C Eng)

European Engineer (Eur Ing)

Senior member of IEEE

Member of IEEE IAS, IEEE PES, IEEE PELS, IEEE RAS,

Member of IEE

Member of NSPE

Professional Engineer in NC, GA, FL, TX

Education and experience registered at The National Council of Examiners for Engineering and Surveying (NCEES)

Certified Energy Manager (CEM)

DOE Qualified Steam Specialist

## Registration Fee

There is no cost to attend the workshop but space is limited. Pre-registration by **Wednesday, May 3<sup>rd</sup>, 2006** is requested, so that we can provide adequate facilities. Light breakfast, lunch and refreshments are provided, courtesy of PG&E and The Gas Company.

## How to Register

To register for the workshop, reply to Valerie Ingraham, 916-654-4044 or [vingraha@energy.state.ca.us](mailto:vingraha@energy.state.ca.us) and provide the date/location of the workshop you would like to attend and full contact information. Supplementary information will follow upon your reservation.

\*For questions about technical content, contact Roger Lawrence, 919-515-6682 or [rogerlawrence@rglsolutions.com](mailto:rogerlawrence@rglsolutions.com)

\*For questions about the program or registration, contact Valerie Ingraham, 916-654-4044 or [vingraha@energy.state.ca.us](mailto:vingraha@energy.state.ca.us)